

## **ABSTRACT**

**[00296]** The present invention concerns methods, compositions and apparatus for detecting, identifying, quantifying and/or sequencing target biomolecules, such as nucleic acids or proteins. Where the target biomolecule is not a nucleic acid, the target or a ligand that binds to the target may be tagged with an oligonucleotide or nucleic acid. The presence of target molecules in samples may be detected by a variety of enzymatic processes that generate a detectable product, such as pyrophosphate (PPi) or ATP. In preferred embodiments of the invention, the product is detected by a bioluminescence regenerative cycle (BRC), utilizing luciferase mediated bioluminescence. In other preferred embodiments, thermostable enzymes may be used in either isothermal or cyclic thermal reactions, such as terminal transferase activity or nucleic acid polymerization, to generate PPi. Apparatus and compositions for biomolecule analysis are also disclosed. Methods for analysis of generated data are also disclosed herein.